REMARKS

Receipt of the Office Action mailed August 1, 2003 is acknowledged.

Claim 13 has been amended to more precisely define applicant's invention. Support for the amendments is found in the specification and drawings including page 8, line 7 – page 11, line 8.

Support for the amendments to claim 14 is found in the specification including page 4, line 31-page 5, line 2 and page 5, lines 9-11 and 21-25.

Support for amended claim 16 is found in the specification including page 5, lines 25-32.

Support for amended claim 19 is found in the specification including page 5, lines 25-30.

Support for new claim 21 is found in the specification including page 8, lines 6-19.

Restriction Requirement

The Examiner has imposed a final restriction requirement. In response to the requirement, applicant reaffirms his election of examination of the invention of Group II, claims 13-20 and new claim 21, drawn to a sprue insert-set.

Drawing Objections

The Examiner objected to the drawings as failing to comply with 37 C.F.R. §1.84(p)(5) for lacking the following numeric designations: numeral 140 in

Figures 2–4, and numeral 254 in Figure 7. Applicant notes that the drawings reference 140a and 140b, while the specification references 140. Applicant has amended the specification to correctly recite either 140a or 140b. Applicant has also corrected Figure 7 to include numeral 254.

The Examiner also objected to the drawings as including numeral 164 in Figure 5 which is not included in the specification. The Examiner's attention is directed to page 8, line 34 of the specification that recites "heating element lead 164". Applicant has amended the specification to correct an error at page 9, line 8. Applicant has amended the specification to correctly reference lead 163, rather than 164.

Applicant has further amended the specification to correct minor typographical errors. These amendments do not raise any issue of new matter.

Specification Objections

The Examiner has objected to the abstract and has urged that "130" should be changed to "150", "136" should be "156", "132" should be "152" and "155" should be changed to "115". Applicant has amended the abstract to no longer recite numerals and thus the basis for the Examiner's objection has been overcome.

Claim Objections

The Examiner objected to claim 20. Applicant has cancelled the claim.

35 U.S.C. § 112 Rejections

The Examiner has rejected claims 13-20 as indefinite. The Examiner has urged that in claim 13, the claims limitations "tubular sprue body insert", "said body insert", "said sprue insert", "the sprue insert", "the body insert", and "the said insert" are all used but it is unclear whether all of these limitations refer to numbers "150" and "258", or if the "sprue tip insert" was intended to be claimed by one or more of these limitations. The Examiner has urged that "sprue insert-set" as claimed in the preamble is incomplete without both the "tubular sprue body insert" and the "sprue tip insert".

Applicant has amended claim 13 to specifically refer to "insert", "sprue tip inset", and "sprue body insert". Support for the amendment may be found in the specification including at page 4, line 31 - page 5, lines 3-5. The basis for each of the Examiner's objections has been overcome. The Examiner is respectfully requested to withdraw his rejection of claim 13 – 20 on this basis.

35 U.S.C. § 103 Rejections

A. Rejection of Claims 13, 14, 18 and 19 over Perella et al. in view of Steinman et al.

The Examiner has rejected claims 13, 14, 18 and 19 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,379,827 to Perella et al. in view of U.S. Patent No. 3,137,904 to Steinman et al. The Examiner maintains that Perella et al. disclose a die casting machine that includes fixed and movable dies in addition to a plurality of inserts that define a tapering, tubular sprue/runner having a configuration that causes increased flow velocity

closer to the die cavity such that a parting line defines mating surfaces between the die portions as well as the first and second curved grooves of the sprue runner cavity defined by the plurality of inserts, all of which further define a curved transition channel along the parting line when the dies are closed. The Examiner acknowledges that Perella et al. do not disclose the use of heating means that heat the insert, a sprue tip insert, and cooling means associated with the sprue tip insert. The Examiner urges that Steinman et al. disclose a sprue bush mounting for die-casting machines that includes fixed and movable dies, a tubular sprue insert (water-jacketed sprue bushing) mounted within the fixed die, a sprue tip insert (sprue spreader) mounted within the movable die 28, such that the sprue spreader has ejector pins that serve as a heat sink associated with it, as well as a water cooling means, and a heat source that serves to heat the nozzle/sprue bushing interface. The Examiner urges that it would have been obvious to modify the machine disclosed by Perella et al. by adding the sprue body insert heating means, a sprue tip insert, and sprue tip insert cooling means as taught by Steinman et al. to avoid freeze-up of metal in the vicinity of the nozzle/sprue bushing interface, while having an ejector assembly for removing the cast product, and for reducing the temperature, thus avoiding metal expansion and distortion in the critical interface regions within the die casting assembly. Applicant respectfully traverses this rejection.

As amended, claim 13 is directed to a sprue insert-set comprising:

a tubular sprue body insert for mounting in the fixed die and a sprue tip insert for mounting into the moving die, the body insert having a sprue channel extending therethrough;

an outer end defining an inlet opening of the sprue channel,

an inner end defining an outlet opening of the sprue channel,

heating means for heating the sprue channel, and

a first curved groove formed in the inner end of the insert leading from the outlet opening of the sprue channel,

the sprue tip insert having an inner end adapted to mate with the inner end of the body insert, a second curved groove formed in the inner end of the tip insert of complementary form to the first curved groove such that when the inner end of the tip insert is mated with the inner end of the body insert the first and second grooves cooperate to form a curved transition channel for connecting the outlet opening of the sprue channel to the runner channel, when the inserts are in place and the dies of the apparatus are closed, and

cooling means for cooling the second curved groove.

The Examiner acknowledges that the Perella et al. reference does not disclose or suggest the use of heating means that heat the insert, a sprue tip insert, and cooling means associated with the sprue tip insert. Additionally, applicant

submits that the Perrella et al. reference fails to disclose or suggest the following elements of amended claim 13:

a tubular sprue insert for mounting in the fixed die having heating means, and

a mating insert in the moving die having cooling means, the inserts forming a curved transition channel connected to the outlet of the tubular insert.

These features allow Applicant to set the melt freeze-point within the curved transition channel and not in the tubular sprue insert, thereby eliminating the formation of a sprue casting.

The Examiner has cited the disclosure of Steinman et al. as curing the defects of Perrella et al. Applicant respectfully submits that the Steinman et al. reference does not cure the defects of the Perella et al. reference.

The Steinman et al. reference does not cure the defects of the Perrella et al. reference because it does not teach or suggest the following elements of amended claim 13: (1) a tubular sprue body insert that has a sprue channel and heating means; (2) a sprue tip insert in the moving die that has cooling means; and (3) curved grooves on the inner ends of the body and tip inserts that cooperate to form a curved transition channel for connecting the outlet of the sprue channel with the runner.

Further, one of ordinary skill in the art would not be motivated to combine the teachings of Perrella et al. and Steinman et al. in the manner urged by the Examiner.

Steinman et al. disclose a sprue bushing mounting for die casting machines. At col. 1, lines 26-29, Steinman et al. set forth that it is an objective to mount the sprue bushing so that elongation of the ... nozzle ... does not in any way impair or distort the dies ... of a diecasting machine. For this purpose, Steinman et al. disclose at col. 2, lines 46-48, an arrangement for mounting a conventional tubular water-cooled sprue bushing in the stationary platen (10) 'so that any expansion of the nozzle 24 will not be imparted to the cover die 19'. . Steinman et al. teach the use of a reverse-tapered water-cooled sprue bushing to ensure rapid solidification of the sprue casting, which in this case is molded as a hollow cone by the use of a conventional 'sprue spreader' (31) in the moving die (28). By contrast, both applicant and Perrella seek to reduce turbulence in the melt flow by avoiding reverse-tapered sprue channels. Perrella emphasizes this at col. 4 lines 39 – 42 and col. 9 lines 59 – 61. Applicant stresses the undesirable turbulence associated with conventional reverse-tapered sprue channels at page 2 lines 30 – 34 of the specification. In contrast to the Steinman disclosure, both Perrella and applicant use forward-tapering melt flow paths. Thus, Perrella teaches away from the type of flow path and sprue disclosed by Steinman. Accordingly, one skilled in the art would not be motivated to combine the teachings of the references in the manner urged by the Examiner.

Further, the Examiner has taken the position that Steinman's water-cooled sprue bushing (13) is equivalent to Applicant's heated sprue body insert. The Examiner's interpretation is in error. Steinman et al. teach cooling bush 13 to quickly form a sprue casting. In contrast, Applicant heats insert 150 to ensure that melt in the sprue channel does not freeze and that no sprue casting is formed. The Examiner notes that Steinman's bushing must be heated by the flame nozzles (27) used to heat the injection nozzle (24) and suggests that Steinman's sprue bushing must therefore have 'heating means'. Applicant submits that Steinman's sprue bushing does not possess heating means; it has cooling means to get rid of excess heat acquired externally. Amended claim 13 requires heating means in applicant's sprue body insert. This element is not disclosed by the Steinman or Perrella references.

The Examiner further argues that the sprue spreader (31), used as part of the mold for Steinman's sprue casting, is equivalent to Applicant's sprue tip insert and that it has cooling means in the form of ejector pins 32 "that serve as a heat sink". Applicant disagrees with the Examiner's position. Applicant notes that the sprue spreader (31) forms part of Steinman's sprue channel, not a curved transition channel between the sprue channel and the runner as explicitly required in claim 13. Further, applicant submits that one skilled in the art would not consider a thin ejector pin to remove the cast product to also serve as a "cooling means."

Further, Examiner has failed to provide evidence supporting his position that one skilled in the art would be motivated to combine the teachings of the references in the manner urged. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d (1438 (Fed. Cir. 1991). The Examiner has failed to cite prior art teaching or suggesting the claimed combination. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Thus, the Examiner has failed to establish a prima facie case of obviousness because he has not cited prior art teaching or suggesting the claimed combination

Moreover, set forth above, even in combination, the references fail to render obvious the presently claimed invention because the combination of the references fails to teach or suggest several elements of applicant's invention as set forth in the rejected claims. Thus, the rejection of the claims on this basis should be withdrawn.

B. Rejection of Claims 15 and 17 over Perrella in view of Steinman and Putkowski

The Examiner has rejected claims 15 and 17 under 35 U.S.C. §103(a) as unpatentable over Perella et al. in view of Steinman et. al. as applied to claim 13

in the above rejection, and further in view of U.S. Patent No. 3,677,682 to Putkowski.

The Examiner asserts that Perrella and Steinman disclose or suggest the features of claim 13, but do not disclose the 90 degree angle of the curved groove within the sprue insert, as well as thermal insulation around the heating means of the sprue insert. The Examiner urges that Putkowski discloses a hot runner system for an injection molding apparatus in which the sprue/runner system includes a surrounding tubular member provided with heaters and associated ceramic insulation, as well as a 90 degree angle extending from the sprue bushing 16 through channel 18, and further extending around a 90 degree bend before subsequent injection through tapered passage 50 into molding cavity 6. The Examiner maintains that the patent teaches that the 90 degree curved groove angle and thermal insulation around the heating means are advantageous for reducing turbulent flow of the melt while maintaining a more uniform temperature within the sprue/runner assembly surrounding the flow to the die cavity.

The Examiner urges that it would have been obvious to one of ordinary skill in the art to modify the die casting machine having a plurality of inserts that define a tapering, tubular sprue/runner as disclosed by Perrella et al. by adding the sprue body insert heating means, a sprue tip insert, and sprue tip insert cooling means, as taught by Steinman et al. and by further adding the 90 degree curved groove angle and thermal insulation around the heating means as taught by Putkowski to reduce turbulent flow of the melt while maintaining a more uniform

temperature within the sprue/runner assembly surrounding the flow to the die cavity. Applicant traverses this rejection.

As set forth above, applicant submits that the Examiner has failed to cite any teaching or suggestion in the prior art to combine the references to make the claimed combination. Moreover, even when combined, the Perrella et al. and Steinman et al. references fail to teach or suggest several elements of amended claim 13. The Putkowski disclosure does not cure the defects of the combination of the references because Putkowski does not disclose a tubular sprue body insert that has a sprue channel and heating means, a sprue tip insert in the moving die that has cooling means, and curved grooves on the inner ends of the body and tip inserts that cooperate to form a curved transition channel for connecting the outlet of the sprue hannel with the runner as set forth in amended claim 13. The Examiner has cited the disclosures of Putkowski relating to the 90° angle of the curved groove within the sprue insert as well as thermal insulation around the heating means of the sprue insert.

The Examiner has not cited any reference to support his position that one skilled in the art would be motivated to modify the Perrella and Steinman references as urged. Putkowski relates to injection molding. In his specification, at pages 3, line17-page 4, line 21, applicant discussed at length why such injection-molding techniques were difficult to transpose to die casting art. In this discussion, Applicant points out that a major long-term R&D program sponsored by ILZRO with this objective in mind was not successful. Despite applicants

disclosure, the examiner maintains that "It would have been obvious to one or ordinary skill in the art in the art at the time the applicant's invention was made to modify the die casting machine ... disclosed by Perrella et. al. ... [and] Steinman et. al. ... by further adding ... [the hot sprue/runner system] as taught by Putkowski ...".

Moreover, for the reasons set forth above, Putkowski does not cure the defects of even the combination of the Perella and Steinman references, because even in combination, the references fail to disclose several elements of applicant's invention as set forth in claim 13.

Claims 15 and 17 depend from claim 13 and thus include all of the limitations of that claim. Accordingly, the Examiner has failed to establish a prima facie case of obviousness of claims 15 and 17 over the cited references. Applicant requests the Examiner to withdraw the rejection of the claims on this basis.

Rejection of Claims 16 and 20 over Perrella in View of Steinman and Whitehorn

Claim 20 has been cancelled. The subject matter of claim 20 has been incorporated into claim 19 by the present amendments. Claim 19 depends from claim 13. As set forth above, the Examiner has not cited prior art that teaches or suggests combining the teachings of Perrella et al. and Steinman et al. as urged by the Examiner. Further, even in combination, the references fail to disclose or suggest several elements of claim 13 and thus do not render obvious claim 13.

The Whitehorn reference does not cure the defects of the Perrella et al. and Steinman et al. references.

Claim 16 depends from claim 13 and includes the limitation that the sprue body insert includes temperature sensor means. Claim 19 provides temperature sensor means in the tip-insert.

The Examiner urged that, "It would have been obvious to one or ordinary skill in the art in the art to modify the die casting machine having a plurality of inserts that define a tapering, tubular sprue/runner as disclosed by Perrella et. al. by adding the sprue body insert heating means, a sprue tip insert, and sprue tip insert cooling means as taught by Steinman et. al. and by further adding the combination of a plurality of heating elements, a series of thermocouples (104, 108, 112), and an associated temperature control unit, ***in order to precisely control temperature to extend the operational life of the nozzle assembly and improve casting quality***..." [Emphasis added]. Controlling the temperature of the injection nozzle is not an element of applicant's invention as claimed. Nor would one of ordinary skill in the art be motivated to modify the teaching of Perrella or Steinman in such a manner. The Steinman et al. reference addresses accommodating nozzle stresses. The Perrella et al. reference teaches making hollow sprue castings. There is nothing in either disclosure to motivate one skilled in the art to modify the teachings therein to control the temperature of an injection nozzle.

The production and ejection of sprue castings are features of the disclosures of both Perrella and Steinman, these being essential for achievement of Perrella's objectives, but incidental to the achievement of Steinman's objectives. The use of heated sprue channels is therefore contra-indicated by both Perrella and Steinman. Additional heating of these channels (ie, in addition to the unavoidable heat input from the melt and from the heating of nozzle 24 of Steinman) would clearly be counterproductive, as it would slow the cycle time. Accordingly, there is no suggestion whatsoever in the disclosures of Perrella and Steinman that the sprue channel should be additionally heated. Moreover, Steinman discloses a water-cooled sprue channel, not a heated sprue channel or a heated sprue body insert.

Claim 19 includes the limitations of claim 13 and therefore is also not rendered obvious for the reasons set forth above with respect to claim 16.

The Examiner's rejection of claims 16 and 19 is improper. Applicant respectfully requests the Examiner to withdraw the rejection of the claims on this basis.

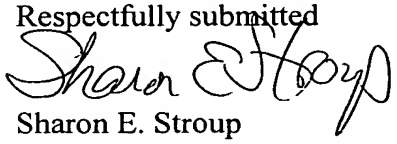
Allowance of claim 16 is respectfully requested.

CONCLUSION

In the light of the above amendments and remarks, Applicant respectfully submits that all pending claims currently presented are in condition for allowance. If, for any reason, the Examiner disagrees, he is asked to call the undersigned attorney at 202-736-8298 in an effort to resolve any matter still outstanding *before* issuing another action. The undersigned attorney is confident that any issue which might remain can be readily worked out by telephone.

Favorable reconsideration is respectfully requested.

Respectfully submitted



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Date: November 3, 2003

Attachments:
Abstract
Request for Approval of Drawing Corrections
with Red Marked Drawings
Response Transmittal

ABSTRACT

A sprue insert-set which substantially eliminates sprue castings and improves melt-flow in high-pressure hot-chamber diecasting. The insert-set consists of (i) a heated sprue body insert for mounting in the fixed dieblock of a die set and (ii) a cooled sprue tip insert for mounting in the moving dieblock of the die set. The body and tip inserts are mounted so that their inner ends mate with one another in the region of the die parting-line to conjointly form a curved transition channel that connects the sprue channel in the body insert with a runner channel formed along the parting-line of the die set. The temperatures of the body insert and the tip insert can be controlled so that the freeze-point occurs in the transition channel and the melt in the sprue channel is able to run back into the machine nozzle at the end each shot, thereby eliminating sprue castings.

IN THE DRAWINGS:

A Request for Approval of Drawing Corrections is attached hereto, indicating proposed drawing changes in red.

IN THE ABSTRACT:

Please amend the Abstract as follows:

ABSTRACT

~~Die~~ A sprue insert-set ~~inserts and methods for use in high-pressure hot-chamber diecasting are disclosed~~ which substantially eliminates sprue castings and ~~greatly~~ improves ~~melt~~ melt-flow in high-pressure hot-chamber diecasting. The ~~die inserts~~insert-set ~~comprise~~ consists of (i) a heated sprue body insert ~~(130, 258) adapted for location~~for mounting in the fixed dieblock ~~(112)~~ of a die set ~~and having a sprue channel (136, 260)~~ and (ii) a cooled sprue tip insert ~~(132, 266) adapted~~ for mounting in the moving dieblock ~~(114)~~ of the die set. The ~~sprue~~ body and tip inserts are mounted ~~coaxially~~ so that their inner ends mate with one another in the region of the die parting-line ~~(155)~~ to conjointly form ~~at least one~~a curved transition channel ~~(138, 262, 264)~~ that connects the sprue channel ~~(136, 260)~~ in the body insert with ~~at least one~~a runner channel ~~(140, 254, 256)~~ formed along the parting-line of the die set. The temperatures of the ~~sprue~~ body insert and ~~the sprue~~ the tip insert ~~are~~ can be controlled so that the freeze-point occurs in the transition channel and the melt in the sprue channel is able to run back into the machine nozzle at the end of each shot, ~~there by~~ thereby eliminating sprue castings.